



# Department of Defense DIRECTIVE

NUMBER 3222.3

August 20, 1990

ASD(C3I)

SUBJECT: Department of Defense Electromagnetic Compatibility Program

- References:
- (a) DoD Directive 3222.3, "Department of Defense Electromagnetic Compatibility Program," July 5, 1967 (hereby canceled)
  - (b) DoD Directive 5160.57, "Electromagnetic Compatibility Analysis Center (ECAC)," September 23, 1966 (hereby canceled)
  - (c) DoD Directive 4120.3, "Defense Standardization and Specification Program," February 10, 1979
  - (d) [DoD Directive 4650.1](#), "Management and Use of the Radio Frequency Spectrum," July 24, 1987
  - (e) DoD Directive C-3222.5, "Electromagnetic Compatibility (EMC) Management Program for SIGINT Sites (U)," April 22, 1987
  - (f) "Manual of Regulations and Procedures for Federal Radio Frequency Management," authorized by U.S. Department of Commerce, May 1989 Edition (with revisions for September 1989 and January 1990)<sup>1</sup>

## 1. REISSUANCE AND PURPOSE

This Directive reissues reference (a) to:

1.1. Update DoD policy on an integrated EMCP to ensure EMC of all military electronic and telecommunications equipments, subsystems, and systems during their conceptual, design, acquisition, and operational phases.

1.2. Assign specific and joint responsibilities to DoD Components for leadership in the following EMCP areas:

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<sup>1</sup> Available through the U.S. Department of Commerce, National Telecommunications and Information Administration, Room 1605, 14th and Pennsylvania Avenue, NW, Washington, DC 20230.

### 1.2.1. Database and analysis capability.

- 1.2.2. Standards and specifications.
- 1.2.3. Education for EMC.
- 1.2.4. Design.
- 1.2.5. Doctrine, tactics, techniques, and procedures.
- 1.2.6. Operational problems.
- 1.2.7. Test and validation.

1.3. Provide the following EMCP objectives:

1.3.1. Achievement of EMC of all electronic and electrical equipments, subsystems, and systems that are produced and operated by DoD Components. Operational compatibility with the equipment, subsystem, or systems when used in their intended environment is part of, and the main focus of, that objective.

1.3.2. Attainment of built-in design compatibility instead of after-the-fact remedial measures.

1.3.3. Fostering of common DoD-wide philosophies, approaches, and techniques in the design, production, test, and operation of military telecommunications equipments.

1.4. Incorporate DoD Directive 5160.57 (reference (b)) into this Directive to specify the functions, responsibilities, operational relationships, and fiscal arrangements for the ECAC.

## 2. APPLICABILITY

This Directive applies to the Office of the Secretary of Defense (OSD); the Military Departments; the Chairman, Joint Chiefs of Staff and Joint Staff; the Unified and Specified Commands; the Inspector General, Department of Defense (IG, DoD); the Defense Agencies; and the DoD Field Activities (hereafter referred to collectively as the "DoD Components"). The term "Military Services," as used herein, refers to the Army, the Navy, the Air Force, and the Marine Corps.

### 3. DEFINITIONS

3.1. Electromagnetic (EM) Compatibility (EMC). The ability of telecommunications equipments, subsystems, and systems to operate in their intended operational environments without suffering or causing unintentional unacceptable degradation because of EM radiation or response.

3.2. Telecommunication. Any transmission, emission, or reception of signs, signals, writings, images, sounds, or, information of any nature by wire, radio, visual, or other EM systems.

### 4. POLICY

4.1. Policy guidance for the EMCP and the ECAC shall be provided jointly by the Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) (ASD(C3I)) and the Chairman, Joint Chiefs of Staff (CJCS), or designees.

4.2. EMCP applies to the conceptual, design, acquisition, and operational phases for all military electronic and telecommunications equipments, subsystems, and systems. The EMCP includes the following areas:

4.2.1. Database and Analysis Capability. Acquisition of effective databases and mathematical and statistical tools for EM analysis of any telecommunications component, circuit, equipment, subsystem, system, environment, concept, or doctrine and the ability to apply those tools to predict, prevent, and correct incompatibilities. That shall require:

4.2.1.1. A DoD-wide data collection and verification plan to ensure complete and current databases adequate to describe any probable telecommunications environment in sufficient technical and operational detail.

4.2.1.2. Common data processing and analytical techniques to provide rapid and timely summaries of data and analyses of equipments within known or expected environments, site selection and evaluation, analyses of concepts and doctrine for the use of telecommunications equipment in support of military operations, and solution of existing EM operational problems.

4.2.2. Standards and Specifications

4.2.2.1. Adequate and useful military standards and specifications for design, development, procurement, production, test, and measurement related to EMC shall be developed. Retrofits, modifications, and upgrades of fielded telecommunications equipments, systems, and subsystems shall be subject to that process, consistent with projected modification costs and expected operational life of the equipment or system, and shall be done in accordance with DoD Directive 4120.3 (reference (c)).

4.2.2.2. Adherence by all DoD Components to all DoD EMC standards and specifications shall be mandatory for the applicable operational telecommunications equipments, subsystems, and systems, unless duly waived.

4.2.2.3. Where required standards and specifications for EMC either do not exist or need correction, they shall be developed or updated promptly.

4.2.2.4. Authority for waiver control over any of the EMCP standards and specifications shall best at a level determined by the DoD Component concerned. That authority shall be delegated with careful discretion to prevent evasion of the EMC standards and specifications. Notification of all waiver actions must be provided concurrently to the CJCS, or designee of EMCP issues, for review and maintenance of records.

4.2.3. Measurement Techniques and Instrumentation. DoD Components shall maintain the capability to determine EM interference (EMI) effects and verify EMC through measurement. Basic electronic and electrical engineering tools and automated measurement techniques, rather than special purpose instrumentation, shall be used when available.

4.2.4. Education for EMC. Awareness of the effects of EMC deficiencies on the part of all DoD personnel concerned with the design, development, production, test, operational use, and maintenance of military electronic and telecommunications equipment shall be attained through:

4.2.4.1. Training of designers and engineers in the design and production methods and techniques for achieving EMC.

4.2.4.2. Training of operating and maintenance personnel in field techniques to optimize EMC.

4.2.4.3. Emphasis on EMC considerations as a portion of basic electronic and electrical engineering techniques.

4.2.4.4. Inclusion of EMCP within the training curricula for acquisition managers.

4.2.5. Design. Emphasis shall be placed on designing systems, from their conception, to achieve desired EMC performance levels. System design requires the selection of those techniques, circuits and components during the research, development, test, and evaluation (RDT&E) phases necessary to achieve compatible system operation.

4.2.6. Doctrine, Tactics, Techniques, and Procedures. EMC and EMI factors in the field employment of telecommunications equipments, subsystems, and systems shall be considered in the development of doctrine, tactics, techniques, and procedures. To minimize the impact of EMI factors shall require:

4.2.6.1. Analysis for EMC of all current and proposed doctrine, tactics, techniques, and procedures in the earliest possible timeframe to ensure that they shall not be invalidated by degradation of sensors or communications equipment from mutual or external interference.

4.2.6.2. Consideration of EMC factors in war-gaming to ensure awareness of the total EM environment in the evolution of new doctrine, tactics, techniques, and procedures.

4.2.7. Operational Problems. Development of a capability for detecting, reporting, solving, and correcting current time-frame operational EMC problems shall require:

4.2.7.1. Procedures for detecting and channels for reporting EM incompatibilities and EMI, which degrade combat effectiveness in the field.

4.2.7.2. Application of existing measurement and analysis techniques to identify the sources of the problems and determine corrective action.

4.2.7.3. Procedures for rapid implementation of required corrective action.

4.2.8. Test and Validation. Field engineering test facilities and testing in the

intended operational environments are required to verify predicted performance and to establish confidence in EMC design, based on standards and specifications, and in EMC analysis methodology, thus providing:

4.2.8.1. Problem parameter measurements.

4.2.8.2. Evaluation of EMC analysis and predictions in appropriate (real or emulated) environments.

## 5. RESPONSIBILITIES

5.1. The Assistant Secretary of Defense (Command, Control, Communications, and Intelligence) (ASD(C3I)) and the Chairman, Joint Chiefs of Staff (CJCS), or designees, shall be responsible, jointly, for:

5.1.1. Oversight of the EMCP.

5.1.2. Providing policy guidance and direction to the ECAC.

5.1.3. Providing specific direction, as necessary, to ensure a well-coordinated and current EMCP.

5.1.4. Reviewing ECAC's EMCP plan for providing EMC analysis capabilities and use of the EMC databases, annually, and, if required, designating DoD Components to carry out specific requirements of that plan.

5.1.5. Ensuring that adequate database and analysis support is provided by the ECAC to the DoD Components having those responsibilities. The functions of frequency management have a strong influence on operational compatibility, and require database and analysis support. DoD Directive 4650.1 (reference (d)) assigns responsibilities in this area.

5.2. The Chairman, Joint Chiefs of Staff (CJCS), or designee, shall be responsible for:

5.2.1. Collection of information for EMC databases. Those collection efforts should especially consider EMC program needs for spectrum signatures, characteristics, locations, and operating plans for newly fielded or modified systems.

5.2.2. Submission of doctrine, tactics, techniques, and procedures for joint operations to the ECAC for analysis of EMC impact.

5.2.3. Developing and implementing procedures and channels for detecting and reporting current joint operational EMC and EMI problems.

5.3. The Director, Electromagnetic Compatibility Analysis Center (ECAC), shall be responsible for:

5.3.1. The DoD joint EMC program that shall include:

5.3.1.1. Development and maintenance of a coordinated plan for providing EMC analysis capabilities and use of the EMC databases.

5.3.1.2. Development, maintenance, and distribution of EMC databases and EMC analysis models.

5.3.1.3. Providing technical and/or operational EMC analysis support to the ASD(C3I), the CJCS, and the Military Communications Electronics Board (MCEB).

5.3.2. The sponsored EMC program that shall include:

5.3.2.1. Providing EMC analysis on a reimbursable basis to DoD Components developing or operating telecommunications equipment.

5.3.2.2. Providing EMC analysis on a reimbursable basis to other Departments of the U.S. Government and to others, as authorized by the ASD(C3I) (e.g., foreign governments and industry under contract to the U.S. Government).

NOTE: In furtherance of that sponsored program, the ECAC is authorized to communicate directly with all of the DoD Components and other non-DoD activities.

5.4. The Secretary of the Air Force shall:

5.4.1. Be designated as the administrative agent for ECAC.

5.4.2. Program, budget, and finance the joint EMC program at the ECAC, described in paragraph 5.3.1., above. The joint EMC program budget and changes to the joint EMC program budget (e.g., reprogrammings) shall be coordinated with the ASD(C3I) and the CJCS, or designees.

5.4.3. Appoint the Director, ECAC, who shall be a Colonel, subject to approval by the ASD(C3I) and the CJCS, or designees.

5.5. The Secretaries of the Military Departments shall:

5.5.1. Provide a suitably qualified field grade officer to serve as a Deputy Director, ECAC. The responsibilities of the Deputy Directors at ECAC are to:

5.5.1.1. Assist the Director, ECAC, in providing quality EMCP support to all users.

5.5.1.2. Monitor the status of Service-related projects.

5.5.1.3. Assist the spectrum management offices of each respective Service.

5.5.2. Provide such personnel to ECAC, as designated for that Service by the Joint Staff Table of Distribution (JTD).

5.6. The Director, National Security Agency (NSA), shall be responsible for the signals intelligence (SIGINT) portions of the EMCP, as assigned by DoD Directive C-3222.5 (reference (e)).

5.7. The Heads of DoD Components shall be jointly responsible for leadership in each of the following EMCP areas:

5.7.1. Database and Analysis Capability

5.7.1.1. Ensuring that ECAC databases are complete and current for equipments, subsystems, and systems that are acquired, developed, or operated by their respective DoD Components.

5.7.1.2. Using ECAC capabilities maximally, rather than developing duplicate databases or EMC analysis tools. The need for separate databases should decrease as communications between data processing systems improve.

5.7.1.3. Developing new databases and analytical techniques when required for intra-DoD Component problems that, with minimum modification, may be exchanged with and used by the DoD Components.

5.7.2. Standards and Specifications



5.7.2.1. Developing and maintaining a complete range of component, circuit, equipment, subsystem, and system EMC standards. Related standards for prediction, measurement, and validation of EMC shall be included.

5.7.2.2. Ensuring that all specifications for telecommunications equipment cite appropriate EMC standards.

#### 5.7.3. Education for EMC

5.7.3.1. Ensuring that properly balanced emphasis on EMC is included in all formal courses in design, maintenance, and operation of telecommunications components, circuits, equipment subsystems, and systems conducted within their organization.

5.7.3.2. Maintaining current handbooks describing the most effective techniques for meeting the standards for EMC. Adoption of other DoD Component handbooks, which are adequate, is encouraged.

5.7.3.3. Ensuring adequate participation by appropriate members of their staff in symposia, conferences, and other professional activities of the industry organizations and technical societies concerned with EMC and electronic engineering.

5.7.4. Design. Emphasizing EMC in RDT&E of telecommunications equipments, subsystems, and systems and ensuring exchange of information regarding results of those efforts.

5.7.5. Doctrine, Tactics, Techniques, and Procedures. Providing proper EMC-impact consideration in the formulation of their intra-DoD Component doctrine, tactics, techniques, and procedures.

5.7.6. Operational Problems. Developing and implementing procedures and channels for detecting, reporting, solving, and correcting their intra-DoD Component operational EMC problems. They shall provide feedback from that to the standards, design, concepts, and doctrine, and educational and analytical elements of the EMCP.

#### 5.7.7. Test and Validation

5.7.7.1. Development of individual procedures and, as appropriate, in the development of an inter-DoD Component coordinated plan for test and validation in support of the EMCP.

5.7.7.2. Examining and supporting test validation of the EMC performance of their various telecommunications equipments in joint operational environments, as specified by the CJCS, or designee. This involves a dedicated effort in understanding and/or verifying the equipments' performance due to EMC and EMI factors.

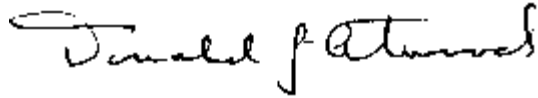
## 6. RELATIONSHIPS

6.1. Other Government Agencies and the Civilian Community EMC problems are common to all users of the EM spectrum. A successful program must consider and serve all who use telecommunications equipment. Within the constraints of national security, and fund or facility availability, the capabilities attained under this EMCP may be made available to non-DoD Components; e.g., the National Telecommunications and Information Administration (NTIA), the Federal Communications Commission (FCC), and other Government Agencies; the International Telecommunications Union (ITU); and the civilian community. The "Manual of Regulations and Procedures for Federal Radio Frequency Management" (reference (f)) gives the interrelationships among the Department of Defense, NTIA, FCC and ITU.

6.2. Electronic Countermeasures (ECM), Electronic Counter-Countermeasures (ECCM), Electronic Combat (EC), EM effects, EM Pulse (EMP), and Radiation Hazards (RADHAZ) Programs. Those programs are specific aspects of the use of or defense against effects of EM radiations. Their existence, as separate programs, is predicated on either military requirements or on overriding urgency due to danger to personnel. As the EMCP progresses, it should augment, be used by, and, in some instances, be integrated with those programs. Advances in EMC that are based upon basic advances in EM technology should be shared among applicable programs. As a minimum, other DoD programs shall be so conducted that equipments and systems developed for their special purposes shall meet all applicable EMC standards of conventional telecommunications equipments, subsystems, and systems. The EMC community should be alert also for techniques developed in other programs that have general application (i.e., ECCM techniques that may also be effective against unintentional interference).

7. EFFECTIVE DATE

This Directive is effective immediately.

A handwritten signature in cursive script, reading "Donald J. Atwood".

Donald J. Atwood  
Deputy Secretary of Defense